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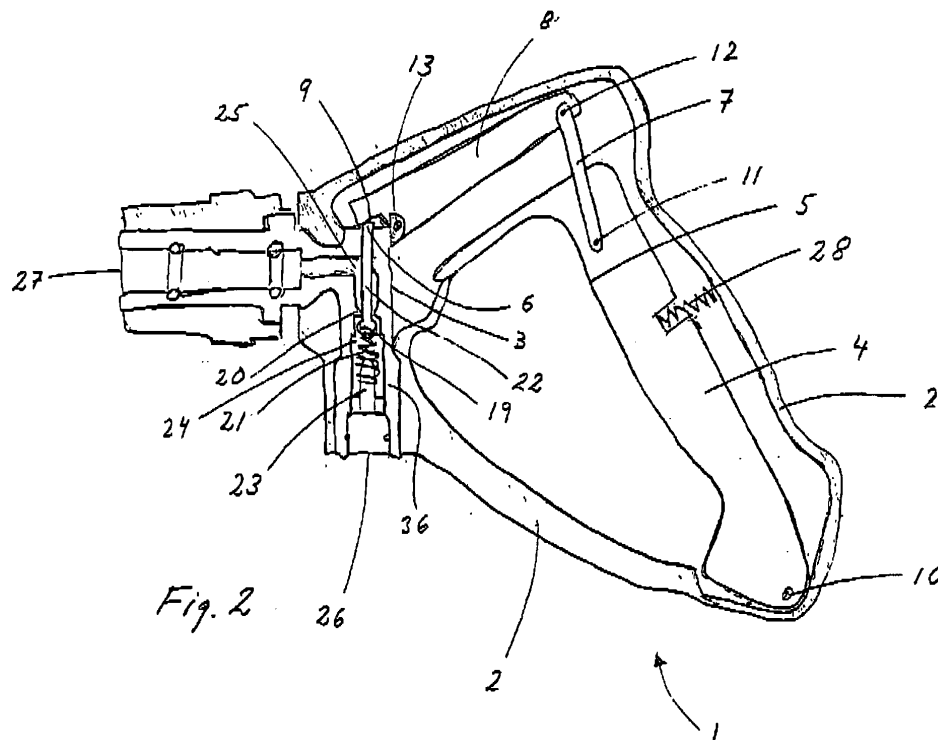
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AL BA MK RS(72) Inventor: **Sigurkarlsson, Svavar****9230 Svenstrup J (DK)**(74) Representative: **Carlsen, Niels G. et al****Budde Schou A/S****Vester Søgade 10****1601 Copenhagen V (DK)**(71) Applicant: **Nilfisk-Advance A/S****2605 Brøndby (DK)****(54) High-pressure trigger with force actuating mechanism using a single-elbow mechanism**

(57) A trigger gun (1) for a high-pressure washer is disclosed, where the trigger gun comprises a handle (2), a valve (3) rigidly supported by the handle and having an open state and a closed state, a trigger having a first area or point of contact (5) for manually applying a force, and a trigger mechanism. The valve (3) further comprises an actuation element (6) for the opening and closing of the valve, while the trigger mechanism provides cooperation between the trigger and the actuation element for enabling a manual control of the opening and closing of the

valve. The trigger mechanism further comprises a mechanical linkage constituted by the handle (2), the trigger (3), an elbow link (7), and a rocker arm (8), which are pivotally connected in a closed loop. The rocker arm has a second area or point of contact (9) for cooperation with the actuation element (6), whereby the trigger mechanism converts a force of action applied at the first area or point of contact (5) to an amplified force of reaction at the second area or point of contact (9) acting on the actuation element (6).

*Fig. 2*

Description

Field of the invention

[0001] The present invention generally relates to a trigger gun for a high-pressure washer, and in particular to the trigger mechanism of such a trigger gun. More specifically, the present invention relates to a trigger mechanism requiring only a small force from the grip of a users hand to maintaining an open valve of the trigger gun.

Description of related art

[0002] A trigger gun for high-pressure washers generally comprises a handle, a trigger, and a valve. The flow of pressurized liquid is controlled by moving the trigger relative to the handle, which opens or closes the valve by way of a trigger mechanism. In the grip of a user's hand, the handle usually rests against the palm with the thumb oppositely placed from the rest of the fingers, of which some or all rest on the trigger. A certain minimum effort is required to operate the trigger gun. Firstly, the weight of the trigger gun and the components attached to the trigger gun has to be supported against the force of gravity. Secondly, the pushing force from the deployment of the pressurized liquid must be compensated for. Under certain circumstances the force of gravity can be counteracted by the pushing force, e.g. when pointing the trigger gun slightly downwards. Thirdly, a force of action is required for activating the trigger, which can be a tiring exercise when using a trigger gun over an extended period of time.

[0003] There are several techniques for lowering the required force of action on the trigger for opening the valve and maintaining an open valve. One example is a trigger that amplifies the force of action by way of a simple levering mechanism, where the trigger itself acts as the lever with the fulcrum or pivot point located close to the valve. Another example is disclosed in EP1389495, which involves a simple levering mechanism with a piston-like pulling mechanism driven by the pressurized liquid upstream from the closing element of the valve. The pulling mechanism provides a helping moment on the levering mechanism, making the trigger easier and less tiresome to pull. However, the piston-like pulling mechanism requires a high-precision manufacturing and is vulnerable to impurities in the pressurized liquid. Another example of a technique for lowering the required force of action for controlling the valve is disclosed in DE 19614663, which involves a mechanical linkage for obtaining a mechanical advantage at the actuation of the valve. However, the mechanical linkage is only involves three effective links, which requires two of the effective links to have a variable length. This is achieved by having one of the joints following a sliding motion relative to the other two joints when pressing the trigger, which requires a high-precision manufacturing of the components involved. The high precision required in both of the refer-

enced techniques is a disadvantage as it increases the production cost and the vulnerability of the trigger gun.

Object of the invention

[0004] An object according to the present Invention is to provide trigger gun for a high-pressure washer, where the trigger gun has a robust trigger mechanism that requires only a small force of action on the trigger to operate. A particular feature of the present invention is that it allows for a trigger mechanism that requires the smallest force of action when the trigger is fully pulled. Another feature of the present invention is that the trigger mechanism may amplify the force in the grip formed between the thumb and the index, or the thumb and the long finger, the most, which allows a more balanced and ergonomic handling of the trigger gun. The force required of a users grip for activating the trigger gun, as well as the force required for continuously operating the trigger gun, may be reduced. Clearly, an advantage with the present invention is that the operating of the trigger requires a smaller effort.

Summary/Disclosure of Invention

[0005] The above object, the above advantage and the above feature together with numerous other objects, advantages and features will be evident from the detailed descriptions given below of preferred embodiments according to the present invention. The objects, advantages and features are according to a first aspect of the present invention obtained by a trigger gun for a high-pressure washer, where the trigger gun comprises a handle, a valve rigidly supported by the handle and having an open state and a closed state, a trigger having a first area or point of contact for manually applying a force, and a trigger mechanism. The valve further comprises an actuation element for the opening and closing of the valve, while the trigger mechanism provides cooperation between the trigger and the actuation element for enabling a manual control of the opening and closing of the valve. The trigger mechanism further comprises a mechanical linkage constituted by the handle, the trigger, an elbow link, and a rocker arm, which are pivotally connected in a closed loop. The rocker arm has a second area or point of contact for cooperation with the actuation element, whereby the trigger mechanism converts a force of action applied at the first area or point of contact to an amplified force of reaction at the second area or point of contact acting on the actuation element.

[0006] A clear advantage, according to the first aspect of the present invention, is that the trigger mechanism may amplify a force employed in the pulling of the trigger to a greater force opening the valve. Further, the trigger mechanism may also amplify the force applied to the trigger for maintaining the valve in a certain state, e.g. in a fully open state, thereby reducing the effort required for continuously operating the trigger gun. The four links of

the mechanical linkage, i.e. the handle, trigger, elbow link and rocker arm, do not require high-precision machining when manufactured. A mechanical link of this kind can be made robust, without the use of high strength materials. This allows for the use of lighter materials for the links, which may reduce the total weight of the trigger. Further, the large number of possible geometric or spatial configurations of four-link mechanical linkages allows for an ergonomically optimized trigger gun, being both light weight and comfortable to handle. As an example, the trigger can be made to pivot around a point located below the user's hand, instead of above it, which makes the grip contract the most at the index finger when pulling the trigger. Clearly, this is an advantage as the index and long fingers are both longer and stronger than the ring and little fingers.

[0007] The handle may be connected to the trigger by a first joint or pivot, the trigger to the elbow link by a second joint or pivot, the elbow link to the rocker arm by a third joint or pivot, and the rocker arm to the handle by a fourth joint or pivot. The second area or point of contact may then be located closer to the fourth joint or pivot than to any of the first, second, and third joints or pivots. This will allow the mechanical linkage to provide a high ratio between the force of reaction over the force of action, as this ratio increases with a decreased distance to the fourth joint or pivot. However, the distance over which the force of reaction can act becomes shorter with a decreased distance to the fourth joint or pivot. Hence, a certain distance between the second area or point of contact and the fourth joint or pivot is required for the trigger mechanism to work.

[0008] A line between the fourth joint or pivot and the first joint or pivot defines an effective handle link, a line between the first joint or pivot and the second joint or pivot defines an effective trigger link, a line between the second joint or pivot and the third joint or pivot defines an effective elbow link, a line between the third joint or pivot and the fourth joint or pivot defines an effective rocker link. Here, the effective elbow link may be shorter than any of the effective handle, trigger, and rocker links.

[0009] For a given movement of the second area or point of contact, the distance the trigger needs to be pulled increases with the length of the effective elbow link. Hence, this particular feature allows for a more compact construction and a slimmer handle of the trigger gun, with the effective trigger link inside the grip of the user's hand. Further, it should be noted that it is not necessary for the second area or point of contact to be located on the effective rocker link; it only has to move in a pivotal motion defined by the rocker arm and the effective rocker arm.

[0010] The effective trigger link and the effective elbow link jointly define an effective trigger angle, which may be obtuse and increase, or may be acute and decrease, when pulling the trigger and activating the trigger mechanism. The effective elbow link and the effective rocker link jointly define an effective elbow angle, which may be

acute and increase, or may be obtuse and decrease, when pulling the trigger and activating the trigger mechanism. Depending on the direction of the force of action, all of the four given combinations of the effective trigger and elbow angles may give a ratio of the force of reaction over the force of action that increases with the pulling of the trigger. This is an advantage as less effort is required when continuously operating the trigger gun.

[0011] The obtuse and increasing effective trigger angle, combined with an acute and increasing effective elbow angle, may be favourable for a construction with a trigger that is pulled towards the palm of a user's hand when activated, where the valve is located in front of the hand. Further, this configuration will enable a more compact design, as the acute effective elbow angle brings the effective trigger link closer to the effective handle link. The obtuse and increasing effective trigger angle, combined with an obtuse and decreasing effective elbow angle, may be favourable for a construction with a trigger placed in the palm of the user's hand and pressed towards the fingers when activated. Alternatively, this configuration may be favourable if the valve is placed behind or on top of the hand of the user and if the trigger is pulled towards the palm.

[0012] The acute and decreasing effective trigger angle, combined with an acute and increasing effective elbow angle, may be favourable for a construction with a trigger that is pulled towards the palm of a user's hand when activated, where the valve is placed in front of the user's hand, and the angle between the effective rocker link and the effective handle link has to be small. The acute and decreasing effective trigger angle, combined with an obtuse and decreasing effective elbow angle, may be favourable for a construction with a trigger that is pulled towards the palm of a user's hand when activated, where the valve is placed behind or on top of the user's hand, and the angle between the effective rocker link and the effective handle link has to be small.

[0013] The handle may be constructed for being received in the palm of a user's hand so that the second joint or pivot and/or the third joint or pivot are located closer to the thumb than the little finger of the user's hand. In a normal grip, where the thumb is opposed to the other fingers, this relative positioning of the thumb and the third joint or pivot means that the index and long fingers perform the longest pulling motion when pulling the trigger, as the effective trigger link performs a pivotal motion around the first joint or pivot. This is an advantage, since the index and long fingers are longer and contribute more to the strength of a grip than the index and little finger.

[0014] The handle may be constructed for being received in the palm of a user's hand so that the trigger moves relative to the user's palm when employing the trigger for opening the valve. Further, the handle may be constructed for being received in the palm of a user's hand so that a finger of the user's hand is inside the closed loop of the mechanical linkage. Clearly, this will allow a

more compact and less cumbersome construction of the trigger gun.

Brief description of the drawings

[0015] Additional objects and features according to the present invention will be more readily apparent from the following detailed description and appended claims, where the former is presented in conjunction with the drawings:

Fig. 1 illustrates a presently preferred embodiment of a trigger gun for a high-pressure washer having a closed valve,

Fig. 2 illustrates the trigger gun in Fig. 1 with the effective mechanical linkage outlined,

Fig. 3 illustrates a presently preferred embodiment of a trigger gun for a high-pressure washer having an open valve with the effective mechanical linkage outlined,

Fig. 4 illustrates an effective mechanical linkage having a concave quadrilateral shape,

Fig. 5 illustrates an effective mechanical linkage having a convex quadrilateral shape,

Fig. 6 illustrates an effective mechanical linkage having a complex quadrilateral shape,

Fig. 7 illustrates an effective mechanical linkage having another concave quadrilateral shape.

Detailed description of the invention

[0016] A cross-sectional view of a presently preferred embodiment of trigger gun 1 for a high-pressure washer is shown in Fig. 1. The handle 2 of the trigger gun 1 rigidly supports a valve 3 for controlling and limiting the flow of pressurized liquid from a high-pressure washer. When using the trigger gun together with a high-pressure washer, the pressurized liquid, usually having a pressure in the range 100-8000 bar, is led from the high-pressure washer to the trigger gun 1 by a hose, which is connected to the trigger gun 1 at the inlet connection 26. During operation the liquid flows from the inlet connection 26 through the valve 3 to the outlet connection 27, to which a hollow lance, wand or a similar tubular device can be coupled for employing the pressurized liquid at a distance from the trigger gun 1.

[0017] The valve 3 has an actuation element 6 extending outside the valve house 36 for opening the valve 3. The actuation element 6 constitutes the outer part of a valve body 19 having a valve stem 22 that pass through a downstream valve passage 25 via a valve seat 20 to an upstream valve passage 24, where it expands in

cross-section to enable a sealing against the valve seat 20. A valve spring 21 in the form of a compression coil spring is fixated between the valve body 19 and a valve spring support 23, which is rigidly supported by the valve house 36. If the pressure is the same in the upstream valve passage 24 and the downstream valve passage 25, the valve spring 21 will provide a closing force in the direction of the valve stem 22, thereby pressing the valve body 19 against the valve seat 20. A force, having an opposite direction and being at least as strong as the closing force, has to be applied to the actuation element 6 in order to open the valve 3.

[0018] With a closed valve 3, the pressurized liquid will establish a significant pressure difference between the upstream valve passage 24 and the downstream valve passage 25. The pressure difference will result in a closing force, which has to be exceeded by a reaction force applied to the actuation element 6 in order to open the valve 3. With an open valve 3, the pressure difference between the upstream valve passage 24 and the downstream valve passage 25 will be considerably less, since now the pressurized liquid also defines the pressure in the latter passage, i.e. the closing force will be smaller. This means that the needed reaction force applied to the actuation element 6 is smaller for maintaining an open valve 3, or for opening the valve 3 further when already being open, than for opening the valve 3 when being closed.

[0019] The trigger gun has a trigger mechanism in the form of a mechanical linkage constituted by a handle 2, a trigger 4, an elbow link 7 and a rocker arm 8, which are connected in close loop by four joints 10-13. The trigger 4 has a first area or point of contact 5, e.g. corresponding to the location at which the long finger of a user is placed when using the trigger gun. The rocker arm has a second area or point of contact 9 for cooperating with the actuation element 6 by conveying a force component being parallel to the valve stem 22. Thereby, the mechanical linkage can convert a force of action applied to the first area or point of contact 5 to a force of reaction at the second area or point of contact 9. As the valve 3 is rigidly supported by the handle 2, the movement of the trigger 4 relative to the handle 2 causes the actuation element 6 to be shifted relative to the valve house 36, thereby allowing the valve 3 to be manually opened by the trigger 4. A trigger spring 28 in the form of a compression coil spring is fixated between the handle 2 and the trigger 4. The trigger spring 28 will act to hold the trigger 4 in the position corresponding to a closed valve 3, and the force provided by the trigger spring 28 has to be overcome before opening the valve 3.

[0020] In an alternative embodiment, one or more of the joints 10-13 may be a pivot or a contraption with a similar function, where the pivotally connected links forming the mechanical linkage also may slide relative to one another.

[0021] The same cross-sectional view as in Fig. 1 of the presently preferred embodiment of trigger gun 1 is

shown in Fig. 2, but with the effective links of the mechanical linkage outlined, i.e. the effective handle link 14, effective trigger link 15, effective elbow link 16, and effective rocker link 17 represent the in Fig. 1 described handle, trigger, elbow link and rocker arm, respectively. An effective links is defined as the line between the two joints of each physical link, i.e. the effective trigger link 15 as the line between the first and the second joints 10-11, the effective elbow link 16 as the line between the second and third joints 11-12, the effective rocker link 17 as the line between the third and fourth joints 12-13, and the handle link 14 as the line between the fourth and the first joints 13 and 10. The quadrilateral defined by the positions of the four joints 10-13 is concave in the sense that the second joint 11 is inside the triangle defined by the first 10, third 12 and fourth 13 joints. The first 10 joint, the fourth 13 joints, and the associated effective handle 14 link are considered fixed when employing the mechanical linkage, whereby all other joints and effective links move relative to these.

[0022] The effective trigger link 15 and the effective elbow link 16 define an obtuse effective trigger angle 29, the effective elbow link 16 and the effective rocker link 17 define an acute effective elbow angle 12, the effective rocker link 17 and the effective handle link 14 define an acute effective rocker angle 36, and the effective handle link 14 and the effective trigger link 15 define an acute effective handle angle 37. In Fig. 3 the same cross-sectional view of a presently preferred embodiment of a trigger gun as in Fig. 2 is shown, but with the trigger activated and the valve in its open position instead of its closed position. Clearly, all of the effective trigger 29, handle 37, elbow 18, and rocker 38 angles increase when activating the trigger gun, i.e. when opening the valve by way of the trigger 15.

[0023] In Fig. 4 a schematic overview of some of the qualitative features of the mechanical linkage in Fig. 2 and Fig. 3 is given. A force of action is represented by a first arrow 30 acting on the effective trigger link 15 at the effective first point of contact 5'. The first 10 and fourth 13 joints are also here considered fixed. Thus, the force of action will result in a force of reaction represented by a second arrow 31 at the effective second point of contact 9', which is located on the effective rocker link 17 at the fourth joint 13. The ratio of the absolute force of reaction over the absolute force of action, i.e. the effective mechanical advantage, is greater than one. In Fig. 4 this is represented by the first arrow 30 being shorter than the second arrow 31. In this abstract representation the first arrow 30 is perpendicular to the effective trigger link 15 and the second arrow is perpendicular to the effective rocker link. For the trigger gun described in relation to Figs. 1-3, the force of action applied to the first area or point of contact 5 does not have to be perpendicular to the corresponding effective trigger link 15. However, the first arrow 30 can be viewed as being the force component of the force of action that is perpendicular to the effective trigger link. Similarly, the second arrow 31 can

be viewed as being the force component of the force of reaction that is perpendicular to the effective rocker link 17.

[0024] It should be noted that the effective first 5' and second 9' points of contact do not have to coincide with first and second areas or points of contact in Fig. 1, respectively. Instead they are, together with the first 30 and second 31 arrows, to be viewed as representation of the moments involved when applying the trigger mechanisms. This means that the physical 5 and the effective 5' second points of contact 5 may be located offset relative to one another by an offset distance. However, they may share the same radial distance to the fourth joint, around which they can move in a circular path.

[0025] In Fig. 5 another possible configuration of the mechanical linkage is depicted. As for the first configuration, the effective elbow link 16 is the shortest effective link and the first 10 and fourth 13 joints are considered fixed. The effective elbow angle 18 is now obtuse and decreases when the corresponding trigger mechanism is employed. The mechanical linkage is convex in the sense that the second joint 11 is outside the triangle defined by the first 10, third 12, and fourth 13 joints.

[0026] In Fig. 6 yet another possible configuration is depicted. As for the other configurations, the effective elbow link 16 is the shortest effective link and the first 10 and fourth 13 joints are considered fixed. The effective trigger angle 29 and the effective elbow angle 18 are both acute, where the former decreases and the latter increases upon the employing of the trigger mechanism. The mechanical linkage is complex in the sense that the effective trigger link 15 and the effective rocker arm 17 cross one another.

[0027] In Fig. 7 yet another possible configuration is depicted. As for the other configurations, the effective elbow link 16 is the shortest effective link and the first 10 and fourth 13 joints are considered fixed. The effective trigger angle 29 is acute and the effective elbow angle 18 is obtuse, where both decrease when the trigger mechanism is employed. The mechanical linkage is concave in the sense that the third joint 12 is inside the triangle defined by the first 10, second 11, and fourth 13 joints.

[0028] In Figs. 4-7 the mechanical advantage, i.e. the ratio of the length of the second arrow 31 over the length of the first arrow 30, is greater than one and increases when the trigger moves in the direction indicated by the first arrow 30. When operating a trigger gun it can be tiresome to maintain a grip on the handle, as a certain minimum force of action is required to maintain an open valve. Any of the mechanical linkages in Figs. 4-7 can be employed to reduce the minimum force of action.

[0029] It should be noted that the lengths of the arrows in Figs. 4-7 are only to show the qualitative, and not the actual quantitative, relationship between the force of action and the force of reaction. The first arrow 30 acts from a direction such that the mechanical advantage will increase if the effective trigger link 15 moves in the direction

of the first arrow 30. If the direction of the first arrow 30 is reversed, the direction of the second arrow 31 would be the opposite and the mechanical advantage would decrease when the trigger link 15 moves in the reverse direction. Instead of defining the mechanical advantage as the ratio of the length of the second arrow 31 over the length of the first arrow 30, or the absolute value of the force of reaction over the absolute value of the force of action, it can be defined as the ratio between the distances travelled by the effective first point of contact 5' and the effective second point of contact 9' when the mechanical linkage is shifted. Naturally, If the mechanical advantage changes, this definition is only relevant for small distances.

Item list

[0030]

- 1 trigger gun
- 2 handle
- 3 valve
- 4 trigger
- 5 first area or point of contact
- 6 actuation element
- 7 elbow link
- 8 rocker arm
- 9 second area or point of contact
- 10 first joint or pivot
- 11 second joint or pivot
- 12 third joint or pivot
- 13 fourth joint or pivot
- 14 effective handle link
- 15 effective trigger link
- 16 effective elbow link
- 17 effective rocker link
- 18 effective elbow angle
- 19 valve body
- 20 valve seat
- 21 valve spring
- 22 valve stem
- 23 valve spring support
- 24 upstream valve passage
- 25 downstream valve passage
- 26 inlet connection
- 27 outlet connection
- 28 trigger spring
- 29 effective trigger angle
- 30 force of action
- 31 force of reaction
- 32 simple concave quadrilateral mechanical linkage
- 33 simple convex quadrilateral mechanical linkage
- 34 complex quadrilateral mechanical linkage
- 35 simple concave quadrilateral mechanical linkage
- 36 valve house

Claims

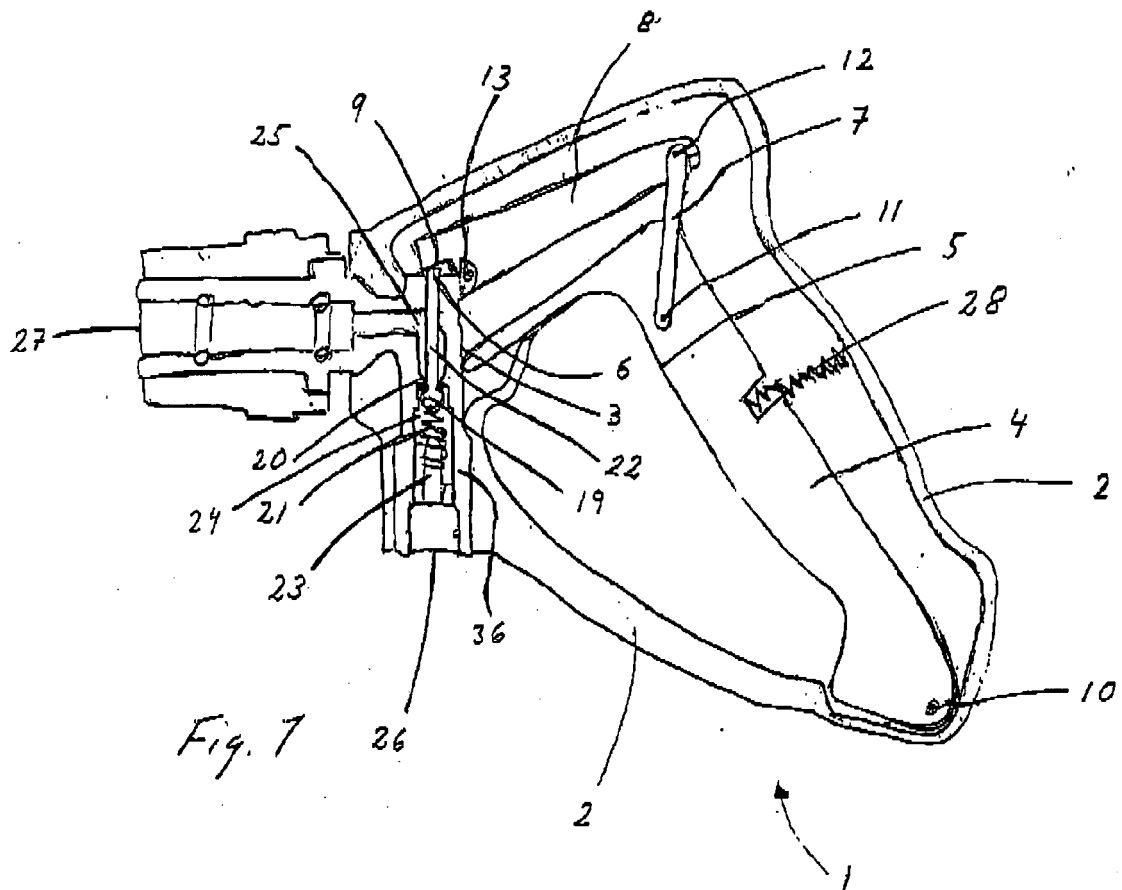
1. A trigger gun (1) for a high-pressure washer, said trigger gun (1) comprising a handle (2), a valve (3) rigidly supported by said handle (2) and having an open state and a closed state, a trigger (4) having a first area or point of contact (5) for manually applying a force, and a trigger mechanism, wherein said valve (3) further comprising an actuation element (6) for the opening and closing of said valve (3), and said trigger mechanism providing a cooperation between said trigger (3) and said actuation element (6) for enabling a manual control of said opening and closing of said valve (3), **characterized in that** said trigger mechanism further comprising a mechanical linkage constituted by said handle (2), said trigger (3), an elbow link (7), and a rocker arm (8) being pivotally connected in a closed loop, wherein said rocker arm (8) having a second area or point of contact (9) for cooperation with said actuation element (6) whereby said trigger mechanism converts a force of action applied at said first area or point of contact (5) to an amplified force of reaction at said second area or point of contact (9) acting on said actuation element (6).
2. A trigger gun (1) according to claim 1, wherein said handle (2) being connected to said trigger (3) by a first joint or pivot (10), said trigger (4) being connected to said elbow link (7) by a second joint or pivot (11), said elbow link (7) being connected to said rocker arm (8) by a third joint or pivot (12), said rocker arm (8) being connected to said handle (2) by a fourth joint or pivot (13), and said second area or point of contact (9) being located closer to said fourth joint or pivot (13) than to any of said first (10), second (11), and third (12) joints or pivots.
3. A trigger gun (1) according to claim 2, wherein a line between said fourth joint or pivot (13) and said first joint or pivot (10) defining an effective handle link (14), a line between said first joint or pivot (10) and said second joint or pivot (11) defining an effective trigger link (15), a line between said second joint or pivot (11) and said third joint or pivot (12) defining an effective elbow link (16), a line between said third joint or pivot (12) and said fourth joint or pivot (13) defining an effective rocker link (17), said effective elbow link (16) being shorter than any of said effective handle (14), trigger (15), and rocker (17) links.
4. A trigger gun (1) according to claim 3, wherein said effective trigger link (15) and said effective elbow link (16) jointly defining an effective trigger angle (29), said effective trigger angle (29) being obtuse and increases when opening said valve (3) using said trigger (4) and said trigger mechanism.

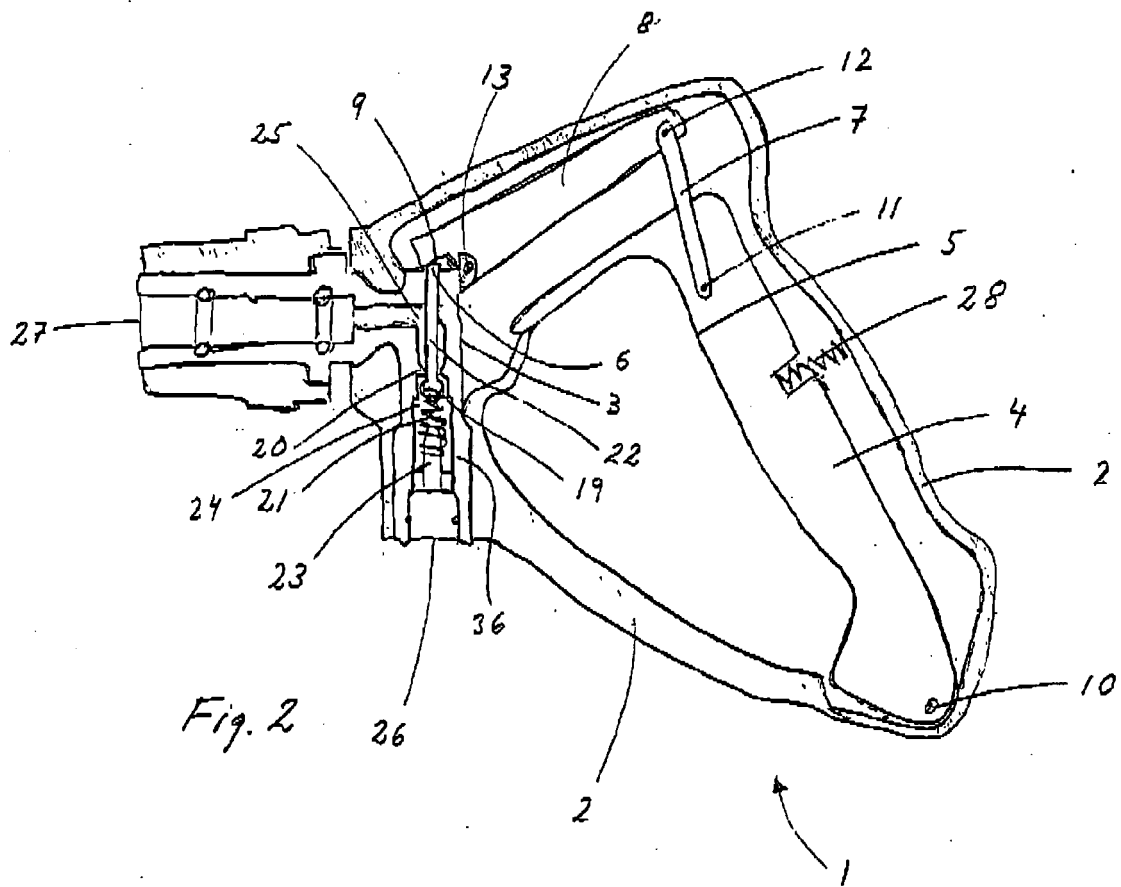
5. A trigger gun (1) according to claim 3, wherein said effective trigger link (15) and said effective elbow link (16) jointly defining an effective trigger angle (29), said effective trigger angle (29) being acute and decreases when opening said valve (3) using said trigger (4) and said trigger mechanism. 5
6. A trigger gun (1) according to any of the claims 3 to 5, wherein said effective elbow link (16) and said effective rocker link (17) jointly defining an effective elbow angle (18), said effective elbow angle (18) being acute and increases when opening said valve (3) using said trigger (4) and said trigger mechanism. 10
7. A trigger gun (1) according to any of the claims 3 to 5, wherein said effective elbow link (16) and said effective rocker link (17) jointly defining an effective elbow angle (18), said effective elbow angle (18) being obtuse and decreases when opening said valve (3) using said trigger (4) and said trigger mechanism. 15 20
8. A trigger gun (1) according to any of the claims 1 to 7, wherein said handle (2) is constructed for being received in the palm of a user's hand so that said second joint or pivot (11) and/or said third joint or pivot (12) is located closer to the thumb than the little finger of the user's hand. 25
9. A trigger gun (1) according to any of the claims 1 to 8, wherein said handle (2) is constructed for being received in the palm of a user's hand so that said trigger (4) moves relative to the users palm when employing said trigger (4) for opening said valve (3). 30
10. A trigger gun (1) according to any of the claims 1 to 9, wherein said handle (2) is constructed for being received in the palm of a user's hand so that a finger of the users hand is inside said closed loop of said mechanical linkage, 35 40

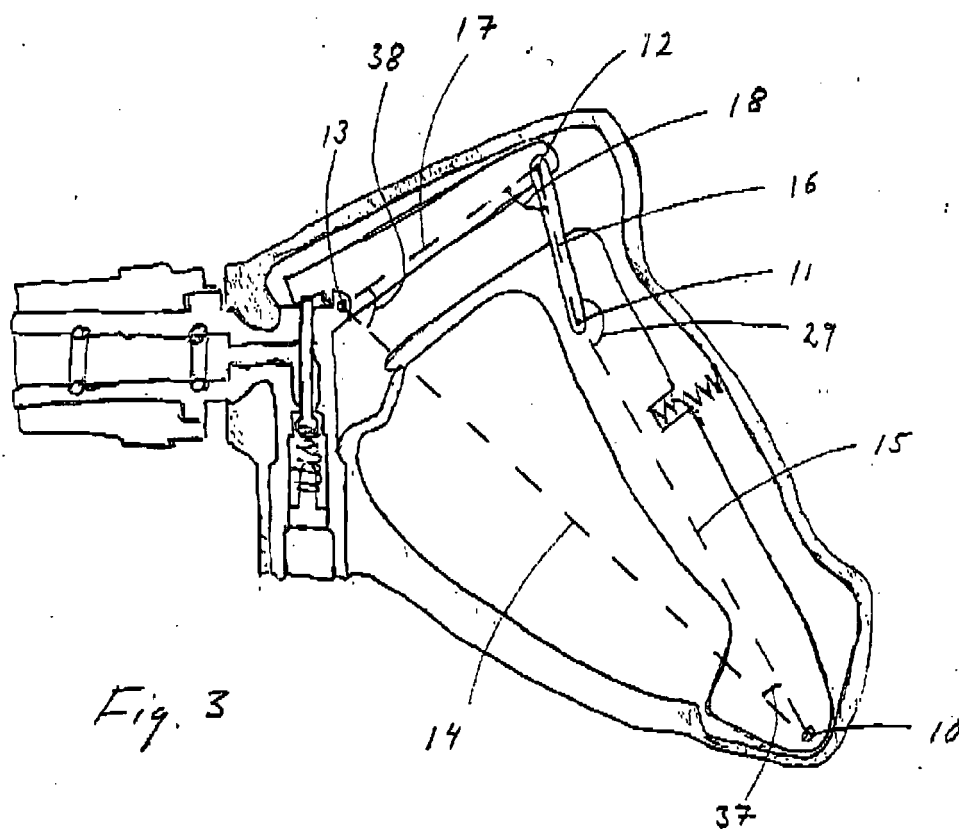
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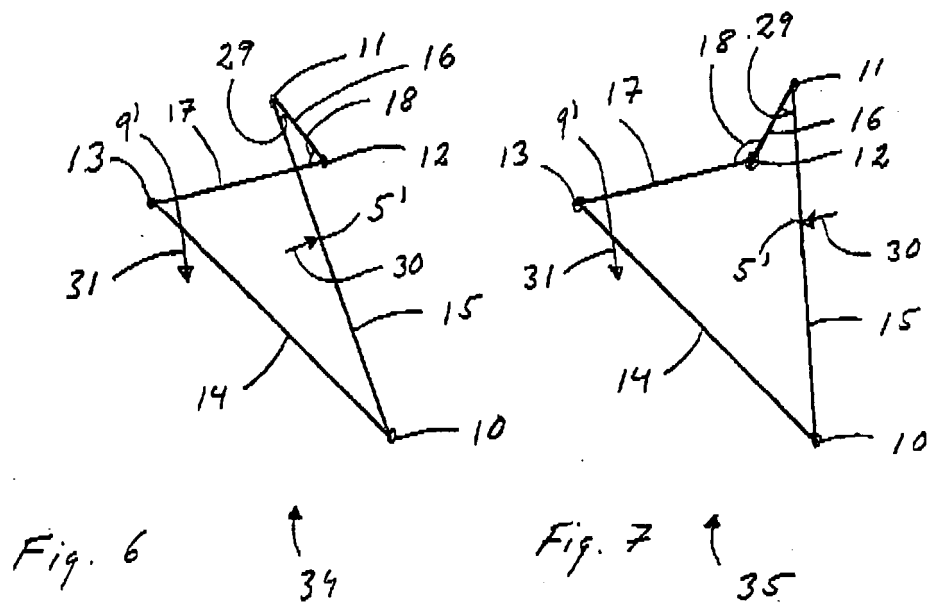
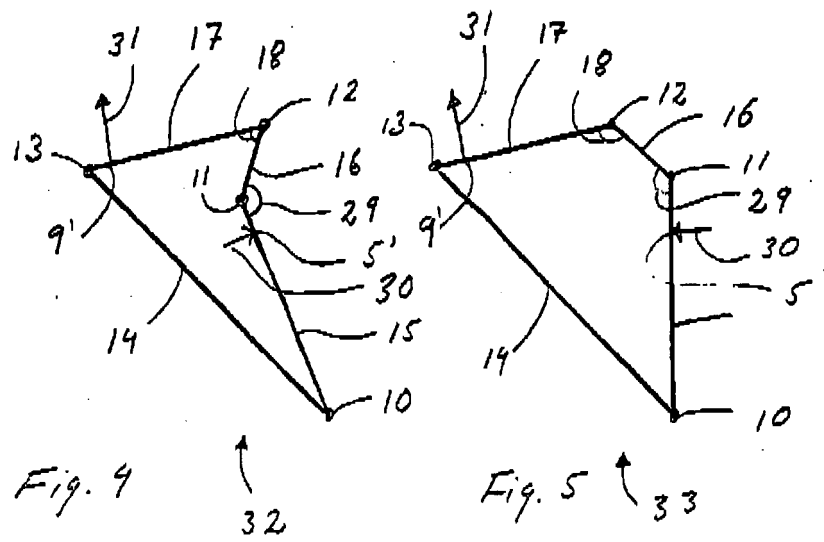
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EUROPEAN SEARCH REPORT

Application Number
EP 08 01 6362

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			B05B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 February 2009	Examiner Gineste, Bertrand
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 08 01 6362

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18-02-2009

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REFERENCES CITED IN THE DESCRIPTION

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